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A NOTE ON THE IDENTIFICATIONS OF SOME OBSCURE GENERA AND SPECIES OF THE FAMILY GOMPHIDAE (ODONATA)

By Lt.-Col. F. C. Fraser, M.D., I.M.S., F.R.E.S.

This paper gives the results of a research into the validity and correct identifications of some obscure genera and species belonging to the family Gomphidae which were either described or merely mentioned by name by the late René Martin. Mention of these is made in two publications—"Notes sur les Gomphines d'Afrique," 1912, *Ann. Soc. ent. Fr.*, **80**, and 1915, *Voy. Alluaud et Jeannel, Afr. Orient.*, "Insectes Nevroptéres, **2**, Odonata," which will be referred to hereafter as *Notes Gomph. d'Afriq.*, and *Voy. All. et Jean.*, respectively.

I am indebted to the authorities of the Museum d'Histoire Naturelle, Paris, for the loan of the Martinian types and more especially to Monsieur Lucien Berland, without whose kind co-operation the carrying out of this research would have been impossible. In addition my thanks are due to Dr. Cesare Neilsen for kindly examining and sending me photographs of the type of *Notogomphus agilis* Martin in the Genoa Museum.

During the course of the investigation some surprising facts have come to light, which will be best appreciated if dealt with under the respective genera and species which they concern.

Dentigomphus Martin, *Notes Gomph. d'Afriq.* : 482.

A short definition of the genus is given by comparison with the characters of genus *Crenigomphus* Selys. A subspecies of the latter genus is mentioned and described as a link between the two genera, but, as the author goes on to say, to include *Dentigomphus* under *Crenigomphus* would necessitate a modification, in great part, of the characters of the latter. As a matter of fact, some such modification has become necessary, because, with the availability of more material for study, it is seen that the original Selysian definition of *Crenigomphus* was erroneous in a few important respects. Thus the small spines on the occiput are normally only present in the females and, when present in the males, are very inconspicuous and merely complemental to those of the other sex, for they serve no useful purpose to the male. So inconspicuous are these in the male that Martin failed to observe them in the genotype of *Dentigomphus* although they are actually present, and he thus gave their absence as a character to distinguish the genus from *Crenigomphus*. Ris, in his "Odonata of South Africa," describes the male of *Crenigomphus hartmanni* as without spines on the occiput but present in the female, and I find that this is true in regard to my own specimens. Secondly, in regard to the respective lengths of segments 9 and 10 and the development of lateral expansions on segments 8 and 9, such characters are subject to slight variations in the species of the genus *Crenigomphus* and form no grounds for erecting a new genus.

Although Martin named and defined the genus, he never mentioned or described any species belonging to it, so that it has remained till to-day without a genotype. Most fortunately Monsieur Berland, whilst searching in the Martin collection for species belonging to this genus, has come upon one labelled "Dentigomphus rubrithorax Martin, type, L. Tchad." This species has never been described and is undoubtedly a new *Crenigomphus*. Its colours have changed to a lobster red, due to postmortem decomposition, a change not uncommon in xerophilous forms, so that the name "rubrithorax" is a misnomer.

As the species has never been mentioned in the literature by name, I give it the name of *renei* after the late René Martin and transfer it to the genus *Crenigomphus*, the amplification in the definition of which automatically converts *Dentigomphus* into a synonym. The type of *C. renei* is a teneral male in rather poor condition, but I possess a duplicate in my own collection which was collected by Prof. Hale Carpenter in Uganda; a specimen in excellent condition and which I had been unable to identify up to date. The description of this new species follows :—

Crenigomphus renei sp. n.

♂. Abdomen 32 mm. Hind-wing 27 mm.

Head : labium pale creamy yellow; labrum, bases of mandibles and face bright chrome yellow deepening in colour on frons and to ferruginous along the crest of latter which is furnished with a row of minute black denticles. Base of frons above dark ferruginous, the ocelli lying in an area of the same colour; vertex and occiput yellow, the latter with straight

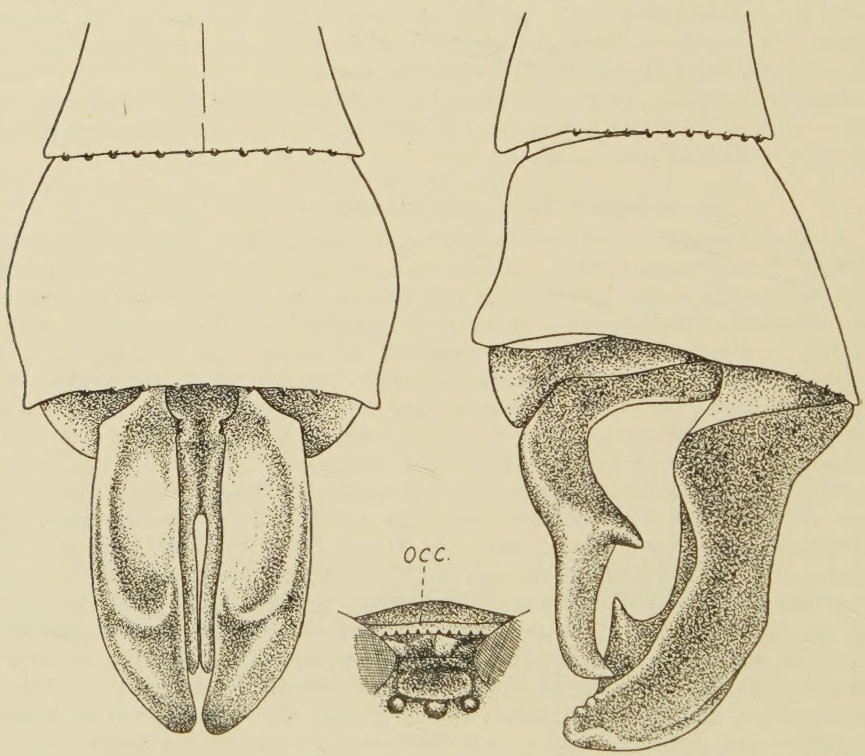

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Fig. 1.—Anal appendages of *Crenigomphus renei* sp. n., dorsal and left lateral views. *Occ.* The occiput viewed from above.

border furnished with about ten to twelve minute black spines. Eyes ferruginous. *Prothorax* dark reddish-brown on dorsum, yellow laterally and for the whole of posterior lobe. *Thorax* chrome yellow with obscure ferruginous markings as follows—an equilateral triangle on middorsum with its apex at antealar sinus, fusiform antehumeral stripes converging above, a rather narrow humeral stripe lying on the suture of the same name, two narrow oblique stripes on each side mapping out the sutures, the anterior deepening to almost black

in its lower half. Unmarked beneath. *Legs* very short, sandy yellow; middle pair of femora with an obscure stripe on the outer side of the middle third and the hind pair with a blackish coloured subdistal annule. *Wings* tinted with pale yellow especially towards base; costa bright yellow to beyond the pterostigma which is black, rather narrow, braced, covering 4 cells; nodal index $\frac{8\text{–}12 \mid 13\text{–}8 \quad 8\text{–}13 \mid 12\text{–}8}{8\text{–}9 \mid 9\text{–}8' \quad 9\text{–}10 \mid 10\text{–}8}$; all other details as for genus. *Abdomen* yellow, tinted with ferruginous and marked with black and reddish-brown as follows—a dark reddish-brown annule at base of segment 1; two quadrate spots of the same colour on subdorsum of segment 2 situated at the inner ends of transverse stripes corresponding to the jugal suture; segments 3 to 7 with narrow black basal annules, diffuse dark reddish-brown lines on the jugal sutures and diffuse paired subapical dorsal spots of the same colour which deepen to black and become confluent with each other and with the basal annules of the following segments on 5 to 7; segments 8 to 10 black on dorsum, but this invaded on the dorsum of 8 by yellow spreading from the base and again on the apical margins of segments 9 and 10; on the latter segment, the yellow extending up to the base as a broad dorsal triangular mark. Segments 3 to 7 with broad lateral black stripes, replaced by a central spot on 8. Finally the apical border of segment 10 finely black and bearing minute black spines. *Anal appendages* ochreous margined with black on dorsum and with the apices of all and the tips of the lateral spines of inferior appendage blackish-brown. Superiors rather longer than segment 10, thick, curved down at apex which has several blunt molar-like teeth below and a very robust ventral subapical spine shaped like a bill-hook. Dorsally the two are seen to converge at the apex and are deeply excavate within, the two depressions forming together a cup-like cavity. Inferior appendage very broad in its basal half, narrow and tapering in its apical which is cleft into two closely apposed branches. At the point where the appendage narrows, a very robust spine arises which is directed outwards and somewhat upwards (fig. 1). Female unknown.

Habitat.—The type male in the Paris Museum is from Lake Tchad; another male in my own collection is from Uganda and was taken at "water holes at the south end of Lake Albert, 10.xii.29," by Prof. *Hale Carpenter.*

Pseudictinus Martin. *Voy. All. et Jean.* : 22. Nom. nud.

The name only is mentioned in a faunistic list; no definition of the genus and no species belonging to it has ever been given. Mr. Cowley informs me that in a letter written to E. B. Williamson by Martin (4 May, 1919) the following occurs—"Genus Pseudictinus is mine but it has never been published. I have simply noted the unique P. tigris from Nigeria and the description of the characters of the genus."

An attempt by Monsieur Berland to trace the species named "Pseudictinus tigris" in the Martin collection resulted in failure, although it is mentioned in the Museum list of Martin's species and was sought for under other African genera such as *Ictinus*, etc. Thus both names are absolute *nomina nuda* and invalid.

Oxygomphus Lacroix, 1921.

Oxygomphus Tillyard, 1917, *Biology Dragonflies* : table opp. p. 282. (Name only in a faunistic list.)

Oxygomphus Lacroix, 1921, *Ann. Soc. linn. Lyon*, **67** : 48. (No description given but refers name to Martin MS.)

Oxygomphus agilis Lacroix, 1921, *loc. cit.* (Species mentioned as the genotype of *Oxygomphus* but no description given.)

Oxygomphus martininus Lacroix, 1921, *loc. cit.* (Described as a new species.)

A search in the Martin collection revealed the presence of a specimen labelled—"Oxygomphus agilis Martin, Congo," in a good state of preservation. Martin had described another African Gomphine under the genus *Notogomphus*

with the same specific name *agilis*, and it occurred to me to compare its description with this undescribed species. The latter insect has a unique-shaped tenth abdominal segment, an equally unique development of the posterior hamules of the genitalia and a curiously elevated and curled occiput. All of these characters are described for *Notogomphus agilis*, and moreover the colour and markings were identical so that there could be no doubt but that the two insects were one and the same.

If *Notogomphus agilis* had proved to be a true *Notogomphus* then the position of *Oxygomphus* would be that of a mere synonym, but unfortunately its characters differ very widely from all other species of that genus and so a new genus becomes necessary to accommodate it. The late Dr. Ris who had examined the type of *Notogomphus agilis*, also expressed the opinion that it was not a true *Notogomphus* (1909, *Ber. Senckenb. Naturf. Ges.*, **40** : 25, 26).

Mr. J. Cowley has kindly given me his opinion as to the validity of the generic name *Oxygomphus*, which he expresses as follows :—" No generic description has ever been given, but Lacroix describes a species which therefore validates the name *but only as from* 1921. The genotype cannot be ' agilis,' as it is undescribed; the genotype is therefore automatically *martininus*, the only described species." It was subsequent to this opinion being given that I discovered the synonymy of *O. agilis* with *N. agilis* and upon my informing Mr. Cowley of the fact he emended his opinion as follows :—" If Lacroix states that he had Martin's *O. agilis* before him, then *N. agilis* is the genotype." Lacroix in his description of *martininus* states definitely that he has seen and compared his specimen with the type of *O. agilis*, so that no doubt remains about the genotype of *Oxygomphus*. It must, however, be mentioned that no generic definition of *Oxygomphus* has ever been given, nor does Lacroix mention any in his description of *martininus*, which is founded on a female. The generic characters of *Oxygomphus* reside in the male and must be taken from those of the type of *N. agilis*, which was unknown to Lacroix at that time, it therefore becomes questionable whether the name *Oxygomphus* was at all validated by Lacroix's publication. The case is a curious and difficult one and will need thrashing out by the International Commission on Nomenclature, but meanwhile I give the genus as Lacroix's and define it as follows :—

Oxygomphus Lacroix.

Dragonflies of medium size belonging to the family Gomphidae, subfamily Gomphinae, coloured black marked sparingly with greenish-yellow. Occiput raised, recurved forward and surmounted by two or more spines. Wings long, narrow, apices rather rounded, base of hind-wing very sinuous, deeply excavated; anal-triangle 3–4 celled; an incomplete basal antenodal nervure present in one or more wings; *Cuii* and *IA* very long and parallel to wing-border; 1–2 rows of cells in postanal area of fore-wing, 3 rows in the hind-wing; reticulation rather close; pterostigma very short, swollen and situated very close to apex of wings as compared to other species of the family. Legs short : hind femora extending to apical end of segment 1, furnished with rows of short but gradually lengthening and moderately widely spaced spines. Abdomen slightly tumid at base, narrow and cylindrical thereafter but slightly widened at segment 8 and apical end of 7; segments 9 and 10 cylindrical, the latter much longer than 9 and abruptly constricted and cylindrical in its basal half and appearing as if telescoped from the end of segment 9; the latter segment with a trace of a similar basal constriction. Anal appendages similar to those of genus *Gomphus*. Genitalia : lamina slightly depressed; anterior hamules very small and fine and more or less concealed beneath the lamina and the enormously lengthened posterior hamules which project far out and anteriorwards beneath the thorax; lobe rather large, spout shaped. Female characters unknown.

Genotype—*Notogomphus agilis* Martin.

Habitat.—West Africa and Nigeria. The characters of the occiput, genitalia and shape of segment 10 will distinguish it from all other genera of the family GOMPHIDAE.

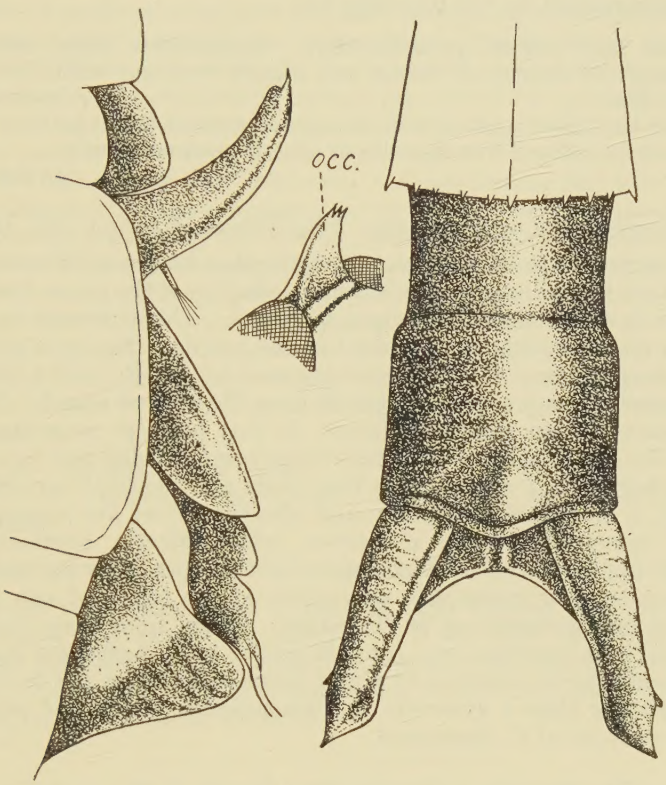

FIG. 2.—Male genitalia and tenth abdominal segment with anal appendages of *Oxygomphus agilis* (Martin). *Occ.* The occiput viewed from the right front.

The type of *N. agilis* is deposited in the Genoa Museum; the type of *O. agilis* is in the Paris Museum, and there is a third male in Mr. Morton's collection, Edinburgh. As regards the type of *Oxygomphus martininus*, I wrote to Monsieur Lacroix and received from him the answer that he had sent the specimen to the late René Martin shortly before the latter's departure for Chile and that it had never been returned. A search made through the Martin collection by Monsieur Berland failed to find it, so that it must be presumed as lost. From its much larger size and the absence of anything strikingly characteristic about the occiput I am strongly inclined to consider that it is not congeneric.

Onychogomphus angela Martin, *Voy. All. et Jean.* : 38.

This specimen turns out to be a male of *Onychogomphus supinus* Selys. The curious anal appendages have been well figured by Hagen in 1854, *Mon. Gomph.*, so that it is surprising that Martin should have overlooked this species. Type of *O. angela* Martin in the Paris Museum.

Lestinogomphus angustus Martin, *Notes Gomph. d'Afriq.* : 484.

A comparison of my *Echinopterogomphus africanus* with Martin's species shows that they are congeneric although different species. *Lestinogomphus* has priority, so that *Echinopterogomphus* becomes a synonym. The two species may be distinguished by the following key :—

Labrum and face uniform greenish-yellow; antehumeral stripe extending whole length of dorsum of thorax and almost confluent with the meso-thoracic collar . . . . . *angustus* Martin.

Labrum and face black marked with strongly contrasted bright yellow; ante-humeral stripe reduced to a short linear spot at centre of dorsum. *africanus* Fraser.

Bursigomphus pardus Martin, *Notes Gomph. d'Afriq.* : 482, 483.

The type proves to be a male of *Crenigomphus hartmanni* Förster. Martin has again been misled here by the Selysian definition of the genus *Crenigomphus* in which it is stated that the occiput is spined. This character is, however, unusual in the male although constant in the female. The type of *B. pardus* as well as four males of *C. hartmanni* examined by Dr. Ris and a fifth male of the same species in my own collection all have the occiput naked. Martin was also led astray by an additional factor, in that his type possessed aberrant venation, the subtriangles of both fore-wings being divided into two cells by a traversing nervure. I also observe that there are 2 cubital nervures in both hind-wings, a most rare aberration, and also that there are incomplete basal antenodal nervures present, characters which Martin overlooked. Such aberrations appear to be not uncommon in this species as my specimens of *C. hartmanni* possess incomplete antenodals at the base and one female has the subtrigones traversed as in *B. pardus*. Apart from these features, the colour, markings, genitalia, etc., are all similar to *C. hartmanni* and thus all the arguments for the erection of a new genus and species fall to the ground. *Bursigomphus* is thus a synonym of *Crenigomphus* which has priority, and *pardus* a synonym of *C. hartmanni*.

Gomphus pilosus Martin, *Notes Gomph. d'Afriq.* : 485.

The venation and the shape of the superior anal appendages place this species in genus *Onychogomphus*. The type is a teneral male with the abdomen completely compressed and badly distorted; the appendages are in very fair condition, but the apices appear to be slightly shrivelled and may be longer in the adult insect than they appear here. The inferior appears cleft into two closely apposed branches, but these project straight back unlike what is seen in other species of genus *Onychogomphus*. Martin gives the anal loop as very irregular, but as a matter of fact that structure is absent and he appears to have confused the anal area with the anal loop as in other species described here. The anal triangle is four celled, the anal area four cells deep, whilst other details are similar to that found in genus *Onychogomphus*. Type in the Paris Museum from former German East Africa.

Gomphus zebra Martin. *Notes Gomph. d'Afriq.* : 485.

The venation of this insect places it at once as an Epigomphine, the first of this subfamily to be recorded from the African continent, unless we except *Libyogomphus* which seems to bridge the gap between the Gomphinae and Epigomphinae. Apart from *G. lucasi*, which is restricted to the coastal area

of N. Africa, no species of *Gomphus* has been found in Africa. The present species will need a new genus to accommodate it and for this I propose the name *Africogomphus* with the following definition :—

Africogomphus gen. n.

Dragonflies of small size belonging to the family GOMPHIDAE, subfamily EPIGOMPHINAE, coloured black marked sparingly with bright yellow. Occiput simple. Wings rather narrow, with moderately open reticulation; base of hind-wing very oblique, tornus angulate, anal triangle 3-celled, the two dividing nervures separated at free border of triangle; no incomplete basal antenodal nervures present; *Cuii* in fore-wing flat; *IA* not pectinate and only a single row of cells between it and border of wing; *Cuii* and *IA* in hind-wing almost parallel, only 2 cells between their distal ends; anal loop absent; only 3 rows of cells in anal area of hind-wing; forking of superior sector of triangle unequal, 5 traversing nervures between the sectors in fore-wing, 3 in the hind; pterostigma rather short, about one-fourth the distance between node and its proximal end, unbraced, but slightly dilated. Abdomen slightly dilated at end segments; genitalia: posterior hamules broad, short, ending in a short recurved spine; bulb of penis bulbous; penis with very small end segment from which two long feelers extend. Anal appendages closely similar to those of *Anisogomphus*, superiors straight and parallel, inferior broadly bifurcated, with widely divaricate branches. Legs short, hind femora extending to base of segment 2, furnished with numerous short minute spines.

Genotype—*Gomphus zebra* Martin.

Habitat.—W. AFRICA: Cameroons. Type of *A. zebra* (Martin) in the Paris Museum.

Nilogomphus Fraser. 1928, *Trans. ent. Soc. Lond.*, **76** : 132–134.

This genus was founded on specimens from Uganda collected by Prof. Hale Carpenter and named *N. carpenteri*. I find now that this species is synonymous with *Notogomphus dorsalis* Selys, the male of which was hitherto unknown. *Nilogomphus* therefore becomes a synonym of *Notogomphus* Selys, and *N. carpenteri* falls to *N. dorsalis*.

TWO NEW *ANACTINOTHRIPS* FROM SOUTH AMERICA (THYSANOPTERA)

By J. DOUGLAS HOOD

(*Professor of Zoology, University of Rochester, U.S.A.*)

Communicated by Dr. S. A. NEAVE, O.B.E., F.R.E.S.

Anactinothrips nigricornis sp. n. (fig. 1, *a*).

♀ (macropterous).—Length about 5·1 mm. (distended, 6·7 mm.). *Colour* very dark, certainly nearly or quite black in life, the tarsi and antennae little, if any, paler, the latter with intermediate segments not at all yellow basally; wings nearly uniform light brown, the fore pair without a submedian dark streak, the hind pair apparently brown in about basal third of anterior margin *; all major setae black, many of them with pointed, pale tips.

* The three specimens which serve as types of this species were all treated with caustic and mounted upon slides before they were sent to me many years ago. However, a comparison with other similarly treated specimens of the same genus, whose true colour is known, makes it possible to describe with a fair degree of accuracy the approximate coloration of the present species.

Head (fig. 1) about 2·33 times as long as greatest width (which is across cheeks, near base), about 3·05 times as long as least width just behind eyes, and about 3·76 times as long as median line of pronotum, its form and chaetotaxy thoroughly typical; produced portion of head (measuring from anterior margin of eyes) slightly more than half as long as its greatest width; vertex slightly elevated (about 30 μ) above level of eyes, somewhat produced and overhanging, the median ocellus directed forward; interocellar setae long (217 μ) and heavy (17 μ wide near base), far surpassing apex of first antennal segment, and about 72 μ apart at their bases; postocular setae less stout than interocellars, about 350 μ in length, 56 μ apart, and 65 μ from inner posterior margin of eyes; dorsal cephalic setae longer than postoculars (about 504 μ), 95 μ apart, and situated about midway between posterior ocelli and base of head; cheeks with two pairs of stout, thorn-like, dorso-lateral setae (78–88 μ) which mark off the length of the head approximately into thirds, and also with from 3 to 5 pairs of shorter, stout setae, the anterior pair of which is constantly almost directly beneath the anterior pair of heavier setae; ventro-lateral surface of head with

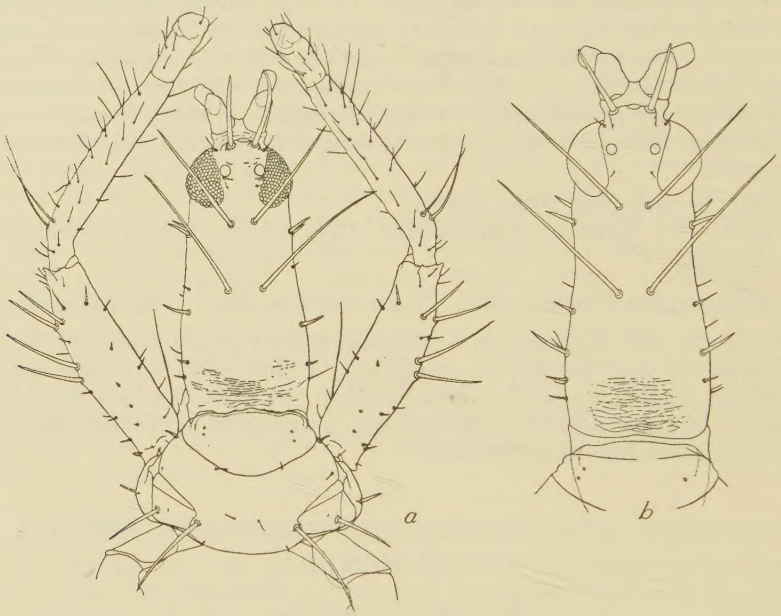

Fig. 1.—a, *Anactinothrips nigricornis* sp. n., head and prothorax, ♀, paratype; b, *A. cristatus* sp. n., head, ♀, holotype, drawn to the same magnification.—Drawn by Mrs. Philip T. Bassett; camera lucida.

several pairs of fine, pointed setae, of which three or four project beyond the silhouette of the cheeks. *Eyes* somewhat protruding, their dorsal length contained in that of head about 4·7 times, their width a little greater than their least interval, their inner margins nearly straight and converging posteriorly; ventral length somewhat less than dorsal, ventral width distinctly greater than dorsal, the inner margins nearly straight and parallel. *Ocelli* of posterior pair about 33 μ in diameter, interval 77 μ, distance from median ocellus 80 μ, the latter with its anterior margin about midway between insertion of antennae and anterior margin of eyes. Antennae of typical form and structure, 8-segmented, segments V and VI (but not VII) each with an apical, ventral, compressed prolongation which is finger-like in dorsal or ventral aspect and bears three short setae along its antero-ventral edge; segment III 604–651 μ, nearly five times as long as I but only 1·96–2·13 times as long as V. *Mouth-cone* heavy, broadly rounded, extending nearly to posterior margin of prosternum, its

length beyond dorsal margin of head about 0·41 the length of the latter; second segment of maxillary palpus 97 μ, about 2·26 times the length of first segment (43 μ). *Prothorax* (fig. 1) about 2·95 times as broad across coxae as median length of pronotum, the latter smooth and with its anterior and posterior margins concentrically arcuate; epimeron and episternum distinct, not fused with pronotum; antero-marginal and midlateral setae minute and slender (about 35 and 17 μ, respectively), antero-angulars much stouter and about comparable with the medium-sized genal setae (49 μ), epimerals 188 μ, postero-marginals 336 μ, coxals 64 μ, the last four pairs named arising from low tubercles and, like the major cephalic setae, with pale, pointed tips. *Fore legs* (fig. 1) of typical form, the fore tarsus unarmed in female; fore femur with a long slender seta arising on inner side of ventral surface near base, and four prominent, stout setae on distal half of outer surface; fore tibia with two, slender, approximate, pointed setae on outer surface near base, these setae very much longer than width of tarsus and measuring 266–322 μ. *Fore-wings* of typical form, with 53–58 accessory setae, and the three subbasal setae 58, 107, and 143 μ, respectively. *Metanotum* with a pair of large dark setae which are about 392 μ long and 269 μ apart. *Abdomen* rather broad and heavy; setae very long and conspicuous, particularly those on distal segments, the inner (outer) pairs on terga I–VII measuring as follows in microns: I 168, II 510, III 532(234), IV 581(613), V 583(742), VI 574(837), VII 560(686); VIII with dorsal pair 224, inner 241, outer 280, lower 210; IX with dorsal and lateral pairs 1290, lower 1190, all of them surpassing tip of tube; one pair of somewhat sigmoid, wing-retaining setae on each of terga III–VII. *Tube* (segment X only) equal in length to head, about 5·5 times as long as greatest subbasal width, which is about 1·8 times the apical width; terminal setae about 434 μ, nearly half as long as tube.

Measurements of ♀ (principally of holotype), in mm.: Length about 5·11 (partially distended, 6·69); head, median dorsal length 0·914, width across eyes 0·328, least width just behind eyes 0·300, greatest width across cheeks 0·393, least width near base 0·356, length of produced portion (measuring from anterior margin of eyes) 0·088, greatest width of produced portion 0·171, least width 0·153; eyes, dorsal length 0·195, greatest dorsal width 0·110, least dorsal interval 0·106, greatest dorsal interval 0·168, ventral length 0·181, ventral width 0·118, ventral interval 0·091; mouth-cone, length beyond dorsal margin of head 0·378; prothorax, median length of pronotum 0·243, width (inclusive of coxae) 0·717; mesothorax, greatest width 0·966; metathorax, greatest width 0·994; abdomen, greatest width (at segment II) 1·13; tube (segment X, only), length 0·914, greatest subbasal width (exclusive of collar) 0·166, least apical width 0·093.

Antennal segments:	1	2	3	4	5	6	7	8	
Length (μ):	133	101	651	388	305	181	126	98	(holotype)
	—	—	613	400	312	182	—	—	(paratype)
	—	—	604	392	294	182	—	—	(paratype)
Width (μ):	82	50	57	59	50	43	36	27	(holotype)

Total length of antenna 1·98 mm.

British Guiana: Rockstone, 28.ii.1913 (*G. E. Bodkin*), 3 ♀♀.

Types in the author's collection.

This species is readily separable from *A. distinguendus* and *A. longisetis* by the much longer head and greatly reduced midlateral prothoracic setae; from *A. meinerti*, which it resembles in the characters just named, by the darkly coloured antennae and very differently proportioned antennal segments, particularly the third in comparison with the fifth; and from *A. fuscus*, with which it agrees well in antennal coloration, by the larger number of accessory wing setae (53–58 in *nigricornis* as against 40 in *fuscus*). If the figure of the last-named species is correct, it differs also in the much stouter interocellar setae, the equi-distant ocelli, the much larger and very differently shaped eyes,

the more concave anterior margin of the pronotum, the long and strong femoral setae, and the very much longer setae on the outer surface of the fore tibiae near their base.

Moulton has assigned Karny's *Lophothrips antennatus* and Schmutz's *Ophidothrips handlirschii* to this genus. Of the former species Priesner has given two careful and obviously accurate drawings of the antenna, and these drawings both show on the seventh segment a distinct ventral apical prolongation—possibly a character of generic value—which is utterly wanting in *A. nigricornis*. In *L. antennatus*, too, there are said to be only 30–35 accessory wing setae. *Ophidothrips handlirschii* seems to be a very different insect, in that the antennae are much shorter and stouter, with the third segment only three times as long as the first (nearly five times the first in *A. nigricornis*), and the tube less than 0·8 the length of the head (in *A. nigricornis* it is equal to the head) and three times as wide at its base as at apex (1·8 times in *nigricornis*).

The present species feeds upon fungus spores, and is probably viviparous.

Anactinothrips cristatus sp. n. (fig. 1, *b*).

♀ (macropterous).—Length about 6·25 mm. (distended, 8·3 mm.). *Colour* dark, nearly black in life, the tarsi and antennae likewise nearly wholly black; second antennal segment brownish apically, the third narrowly yellowish-brown at extreme base and dark brown before apex, remaining segments nearly black, the fourth and fifth slightly and indistinctly paler beyond base and again before apex, the seventh shading to dark brown in distal half, which is concolorous with the eighth; wings nearly uniform light brown, the fore pair without a submedian dark streak but narrowly darker along margins in the area occupied by the inserted portions of the fringing hairs, the hind-wings similarly darkened along front margin but with the remainder of that portion of the wing-membrane which lies anterior to the indistinct median vein just noticeably paler than remainder of wing; all major setae black, many of them with pointed, pale tips.

Head (fig. 1) about 2·47 times as long as greatest width (which is across cheeks, near base), about 3·1 times as long as least width just behind eyes, and about 3·6 times as long as median length of pronotum, its form and chaetotaxy thoroughly typical; produced portion of head (measuring from anterior margin of eyes) about 0·58 as long as its greatest width; vertex elevated to form a transverse ridge which slopes upward and forward, at the top of which, 62 μ above the level of the dorsum of the eyes, are borne the interocellar setae and, on its anterior surface, the forwardly directed median ocellus; interocellar setae long (222 μ) and heavy (19 μ wide near base), surpassing apex of first antennal segment, and about 92 μ apart at their bases; postocular setae less stout than interocellars, about 425 μ in length, 70 μ apart, and 67 μ from inner posterior margin of eyes; dorsal cephalic setae longer than postoculars (about 511 μ), 84 μ apart, and situated about midway between posterior ocelli and base of head; cheeks with two pairs of stout, thorn-like, dorsolateral setae (84–129 μ), of which the first pair marks off the anterior two-fifths of the head and the second pair the posterior fourth; cheeks also with four pairs of shorter stout setae, the anterior pair of which is below but slightly in front of the anterior pair of heavier setae; ventro-lateral surface of head with several pairs of fine, pointed setae, of which three or four project beyond the silhouette of the cheeks. *Eyes* distinctly protruding, their dorsal length contained in that of head about 4·9 times, their greatest dorsal width a little less than their least dorsal interval, their inner margins nearly straight and converging posteriorly; ventral length somewhat less than dorsal, ventral width somewhat greater than dorsal, the inner margins nearly straight and parallel. *Ocelli* of posterior pair about 35 μ in diameter, interval 99 μ, distance from median ocellus 108 μ, the latter with its anterior margin on a line with insertion of antennae. *Antennae* of typical form and structure, 8-segmented, segments V and VI (but not VII) each with an apical, ventral, com-

pressed prolongation which is finger-like in dorsal or ventral aspect and bears three short setae along its antero-ventral edge; segment III about 780 μ (!), nearly five times as long as I but only 2·23 times as long as V. *Mouth-cone* heavy, broadly rounded, extending nearly to posterior margin of prosternum, its length beyond dorsal margin of head about 0·45 the length of the latter; second segment of maxillary palpus 108 μ, about 2·2 times the length of first segment (49 μ). *Prothorax* about 2·85 times as broad across coxae as median length of pronotum, the latter faintly subreticulate anteriorly and with its front and hind margins nearly concentrically arcuate; epimeron and episternum distinct, not fused with pronotum ; antero-marginal and midlateral setae minute and slender (about 15 and 28 μ, respectively), antero-angulars much stouter but scarcely comparable in length (46 μ) with the genal setae, epimerals 137 μ, postero-marginals 364 μ, coxals 70 μ, the last four pairs named arising from low tubercles and, like the major cephalic setae, with pale, pointed tips. Fore legs of typical form, the fore tarsus unarmed in female; fore femur with a long (350 μ) slender seta arising on inner side of ventral surface near base, and four prominent stout setae along outer surface in distal half, in addition to a shorter one more ventrally placed on outer surface near apex and a still shorter one near apex on dorsum close to inner surface; fore tibiae with two, more slender, approximate pointed setae on outer surface near base, these setae much longer than width of tibia and measuring (upper) 224–235 μ and (lower) 322–350 μ. *Fore-wings* of typical form, with 72 accessory setae and the three subbasal setae 52, 80, and 177 μ, respectively. *Metanotum* with a pair of large dark setae which are about 434 μ long and 309 μ apart. *Abdomen* rather broad and heavy; setae very long and conspicuous, particularly those on distal segments, the inner (outer) pairs on terga I–VII measuring as follows in microns: I 160, II 518, III 596(266), IV 650(664), V 652(624), VI 644(812 +), VII 616(——); VIII with dorsal pair 182, inner 238, outer 329, lower 266; IX with the middle pair 1246 and surpassing apex of tube, other setae broken; one pair of somewhat sigmoid wing-retaining setae on each of terga III–VII. *Tube* (segment X only) about 0·97 as long as head, about 5·2 times as long as greatest subbasal width, which is nearly 1·9 times the apical width; terminal setae about 420 μ, approximately 0·4 as long as tube.

Measurements of ♀ (holotype), in mm.: Length about 6·25 (rather fully distended, 8·32); head, median dorsal length 1·053, width across eyes 0·393, least width just behind eyes 0·340, greatest width across cheeks 0·427, least width near base 0·397, length of produced portion (measuring from anterior margin of eyes) 0·115, greatest width of produced portion 0·200, least width 0·171; eyes, dorsal length 0·214, greatest dorsal width 0·129, least dorsal interval 0·137, greatest dorsal interval 0·206, ventral length 0·182, ventral width 0·133, ventral interval 0·126; mouth-cone, length beyond dorsal margin of head 0·476; prothorax, median length of pronotum 0·319, width (inclusive of coxae) 0·910; mesothorax, greatest width 1·197; metathorax, greatest width 1·232; abdomen, greatest width (at segment II) 1·40; tube (segment X only), length 1·019, greatest subbasal width (exclusive of collar) 0·197, least apical width 0·105.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	–	–	780	462	350	206	133	112

Peru: vicinity of Sani Beni, elev. 840 m., 29.vii.–10.viii.1935 (*Felix Woytkowski*), " on dry branches with dry leaves " [Hood No. 1121], 1 ♀.

Type in author's collection.

This, the largest species of the genus and the first to be recorded from the western side of the Andes, differs from all previously described in the genus or subsequently referred to it in precisely the same ways as does *A. nigricornis*, described and discussed above. From that species, to which it is closely related, as well as from all of its other congeners, it is readily separable by the vertical cephalic crest and the very long third antennal segment.

It is a spore-feeder and certainly viviparous.

ON THE VALIDITY OF TRICHIATION AS A SYSTEMATIC CHARACTER IN *TRICHOGRAMMA* (HYM., CHALCIDIDAE)

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Communicated by Dr. G. Salt, F.R.E.S.

Introduction.

The fore-wings of the small chalcid parasites of the genus *Trichogramma* have a very reduced venation, but are traversed by several rows of hairs more or less constant in position and appearance. The number of hairs in these rows has been considered by Ellinger and Sachtleben (1929) to be of systematic significance, and these authors have gone so far as to base three forms, two of which are given specific rank, mainly on this character.

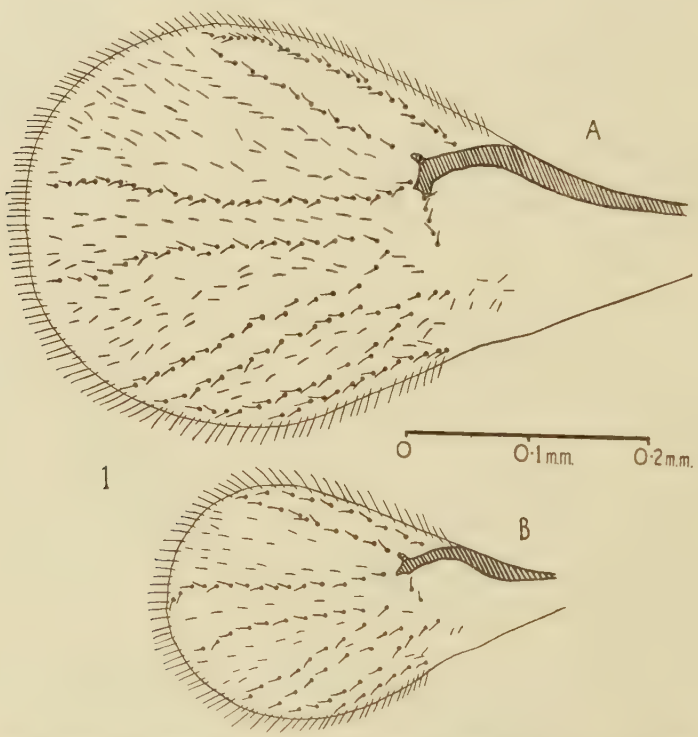

Fig. 1.—Fore-wings of a large and a small specimen of the pure strain of *Trichogramma*, from a photomicrograph. Hairs not included in the totals are drawn without bases.

Casual examination of a pure strain of *Trichogramma evanescens* reared for many generations in the laboratory revealed a very considerable variation in the number of these hairs; and it was decided to investigate the extent of the variation and to examine the validity of the character for taxonomic purposes.

Material and Methods.

A pure strain of *Trichogramma evanescens* Westwood, reared for over one hundred generations exclusively on *Sitotroga cerealella* (Salt, 1935) was made available to us by Dr. George Salt. With the exception of one group of individuals carefully distinguished below, all the specimens examined in the following were either members of this pure strain or F_1 progeny of the strain reared for only one generation upon another species of host. The eggs of these other species were laid in the laboratory and could not previously have been parasitised. Rearing was carried out under constant conditions of temperature and humidity (25° C. and 80% rel. hum.).

For examination the insects were mounted on slides and the number of hairs in each of the nine principal rows (fig. 1) was counted. Arbitrary rules defining the ends of the rows were formulated and consistently observed. The wing-length was measured from the innermost hair of row 3 to the wing-margin opposite the outer end of this row (fig. 1). The body-length given is that of the trunk excluding the head. All measurements were made with a micrometer eye-piece.

The Variation of the Character.

To list the number of hairs in each of the nine principal rows on all the wings examined would take more space than the data would be worth, and only the total number of hairs in these rows is used in this account. In Table I are given the results of counting the hairs on 106 wings of 75 different individuals of the pure strain. It will be seen that the parasites reared on *Sitotroga cerealella* varied between 88 and 118 in this number, and those reared for only one generation on *Maniola janira* between 80 and 147. The extremes for the pure strain and its F_1 progeny, irrespective of host, were 80 and 168. The smallest and one of the largest wings are shown in fig. 1.

Specimens of a wild strain of *Trichogramma*, reared from eggs of *Orgyia* (*Notolophus*) *antiqua* kindly sent to us by Dr. O. W. Richards from Slough, Bucks., were also examined. The number of hairs on their wings is shown in the appendix to Table I. This strain gave us a new maximum of 184 hairs.

The individual counts show a uniform distribution (fig. 2), without any sign of discrete groups which might represent partially separable forms. As is evident from Table I, however, such groups might arbitrarily be produced by the selection of individuals emerging from different hosts.

It may be mentioned in passing that the two fore-wings of the same specimen may differ slightly in the number of hairs they carry. The greatest difference observed among 31 insects was about 6% (138 and 146).

It emerges clearly from this examination, then, that F_1 progeny of a pure strain of *Trichogramma* may vary more than 100% (from 80 to 168) in the total number of hairs in the nine principal rows on their wings.

Number of Hairs and Length of Wing.

The length of the wing was measured in 106 cases. It ranged in our series of measurements from 0·180 mm. to 0·330 mm., a difference of 83% (Table I). The wings from the two sides of the same specimen were sometimes found to differ slightly; a difference of 5% (from 0·245 mm. to 0·255 mm.) being the greatest noted.

What is chiefly important for our present purpose is that this variation in the length of the wing is closely correlated with the variation in the number of hairs on the wings. This is clearly shown in the graph (fig. 2).

Wing-length and Body-length.

The length of the body (the trunk, excluding the head) was measured in 44 individuals (Table I). Owing to the difficulty of mounting the insect quite flat and yet uncrushed, these measurements could not be made very accurately. However, when plotted against the wing-length (fig. 3) they show sufficiently well that, as would be expected, the larger specimens have the longer wings.

TABLE I.

Variation of the F_1 progeny of the pure strain upon various hosts.

Hosts.	Number examined.		Number of hairs.		Wing-length in mm.		Body-length in mm.		
	Wings.	Insects.	Min.	Max.	Min.	Max.	Examined.	Min.	Max.
Sitotroga cerealella	29	22	88	118	0·180	0·225	9	0·27	0·34
Ephestia kuehniella . .	8	5	107	130	0·230	0·250	5	0·30	0·37
Agrotis pronuba	19	10	123	148	0·240	0·270	10	0·33	0·47
Feltia exclamationis	24	15	107	168	0·220	0·330	8	0·35	0·62
Maniola janira	22	19	80	147	0·185	0·290	9	0·29	0·45
Pieris brassicae	3	3	127	135	0·255	0·265	3	0·37	0·40
Bruchus obtectus	1	1	111	—	0·230	—	—	—	—
Orgyia antiqua (wild strain)	15	10	125	184	0·260	0·300	6	0·43	0·72

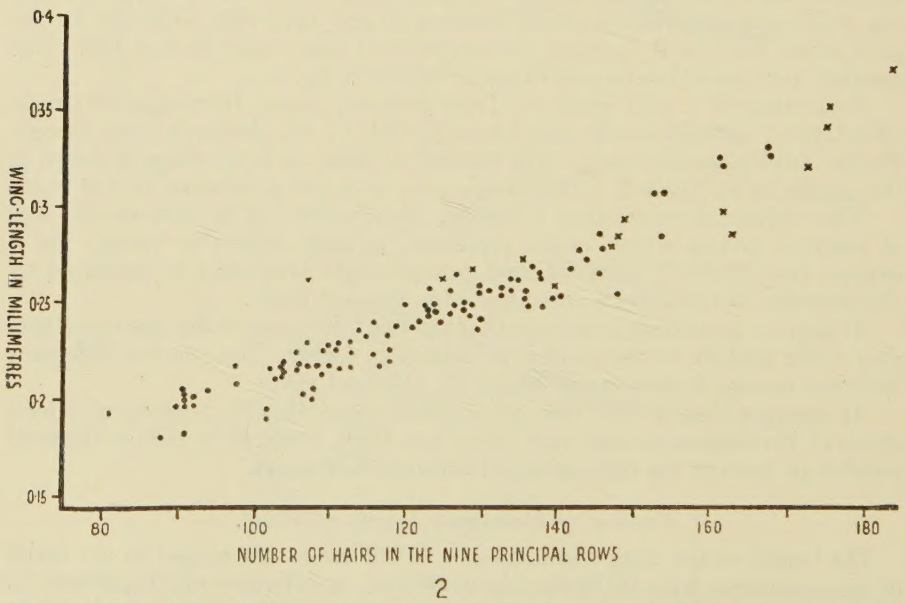

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FIG. 2.—The relation between wing-length and number of hairs in rows. (Specimens o the wild strain are indicated by ×.)

The Size of the Parasite and of its Host.

It is evident from Table I that in general there is a positive correlation between the average or maximum size of the parasites and that of their hosts.

For instance, eggs of *Sitotroga* are smaller than those of *Ephestia* which again are smaller than those of *Agrotis* (cf. Salt, 1935). The average body-length of emergents from these three species was 0·30 mm., 0·33 mm., and 0·42 mm. respectively. The closeness of the correlation is unfortunately obscured in Table I by the fact that two or more parasites are often able to develop in the larger eggs. When this occurs quite small individuals may emerge from very large hosts. Thus, two emergents from an egg of *Maniola* had an average wing-length of 0·260 mm., three from another egg of 0·235 mm., and four from a third egg of only 0·210 mm.

It seems clear that, as is the case with other parasites, in general the largest *Trichogramma* are reared from the largest hosts.

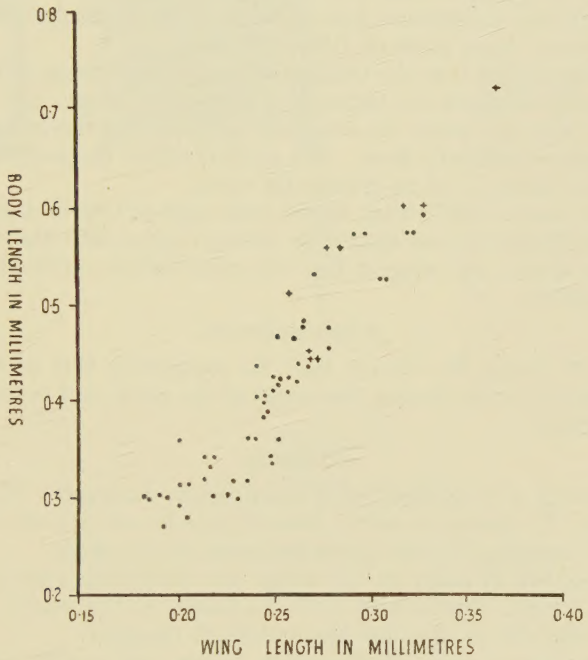

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Fig. 3.—The relation between body-length and wing-length. (Specimens of the wild strain are indicated by ×.)

Discussion.

The observations detailed in the preceding pages lead to a series of conclusions which may be summarised as follows: The number of hairs on the wings of *Trichogramma evanescens* is very variable, and is positively correlated with the length of the wings; this in turn is correlated with the length of the insect, and that, in general, with the size of the host from which it emerged. All this is very understandable—the bigger hosts give the larger parasites which have the longer wings with the greater number of hairs upon them.

Now, since the size of hosts attacked by *Trichogramma* ranges enormously (cf. the host list in Hase, 1925) and the size of individuals emerging from them

very considerably, it might be expected that the number of hairs on the wings of the emergents would be very variable. In our observations, simply by changing the host upon which they were reared, F_1 progeny of a pure strain of *Trichogramma* were made to vary more than 100% in the number of hairs in the nine principal rows on their wings; and there is no reason to suppose that the range of variation was exhausted.

It would seem that forms based on such a variable character would have to differ very widely indeed to be considered valid. The forms described by Ellinger and Sachtleben (1929) differ from each other by only 30%. Their forms I and II, having an average of 135 and 175 hairs respectively, fall within the range of our pure strain, and it is possible that with suitable hosts their largest form having 227 hairs could also have been obtained. Unfortunately, our figures for wing-length and body-length are not directly comparable with those of Ellinger and Sachtleben, but we regard it as significant that their three strains were reared from hosts of different sizes.

In brief, we consider that the number of hairs on the wings of *Trichogramma evanescens* varies *continuously* through a very wide range, and that groups separated out of such a series are artefacts produced by the selection of specimens from hosts of different sizes. We conclude that the number of hairs on the wings, taken alone, is of no systematic value.

The specimens of a wild strain reared from eggs of *Orgyia antiqua* attacked in the open (indicated in our figures by crosses) agree with the data obtained from the pure strain, and suggest that the relationships outlined above are of general application.

Acknowledgment.

We wish to thank Dr. George Salt for suggesting this problem and for much material and advice during the course of the work, and in the preparation of the manuscript.

Summary.

(1) By rearing a pure strain of *Trichogramma evanescens* Westwood upon different hosts, F_1 specimens were obtained which varied more than 100% in the number of hairs in the nine principal rows on the wings.

(2) The number of hairs on the wings was positively correlated with the length of the wings; this in turn with the length of the insect; and that, in general, with the size of the host from which it emerged.

(3) The number of hairs on the wings varies continuously through a very wide range. Grouping within this series is artificial and due to the selection of specimens from hosts of different sizes.

(4) The number of hairs in the nine principal rows on the wings of *Trichogramma*, taken alone, is of no systematic value.

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